

Remarks:

Reconsideration of the application is requested.

Claims 1 and 3-22 are now in the application. Claims 1 and 7 have been amended. Claims 10-19 are withdrawn from consideration. A marked-up version of the claims is attached hereto on separate pages. Independent claim 20 and dependent claims 21 and 22 have been added. No new matter is believed to have been added.

In the second paragraph of item 1 on page 2 of the above-identified Office Action, claims 1, 3, and 9 have been rejected as being unpatentable over Arnold (U.S. Pat. No. 5,937,296) in view of Nishimura (U.S. Pat. No. 4,949,138) and further in view of Economikos et al. (U.S. Pat. No. 6,180,480) (hereinafter "Economikos") under 35 U.S.C. § 103(a).

The rejection has been noted and the claims have been amended in an effort to even more clearly define the invention of the instant application. Support for the changes in claim 1 is found on page 14, line 24 to page 15, line 2 of the instant specification. Only the dependency of claim 7 has been changed.

New independent claim 20 is substantially claim 1 as amended herein, and contains additional features directed to the barrier layer 167 shown in Fig. 3A and described on page 15, lines 4-11 of the instant specification, as well as in original claim 4; the disposition of the barrier layer in the lower and upper regions as shown in Fig. 3A; and the disposition of the insulation layer 167' shown in Fig. 3B and described on page 15, lines 17-20 of the instant specification. No new matter is believed to have been added.

Before discussing the prior art in detail, it is believed that a brief review of the invention as presently claimed, would be helpful.

Claim 1 calls for, inter alia, a trench capacitor, comprising:

said trench having an upper region and a lower region and a conductive trench filling formed of tungsten-containing material disposed in said upper and lower regions of said trench; and

a dielectric layer formed of tungsten oxide material lining said lower and upper regions.

The present invention, as recited in claim 1, is directed to a trench capacitor formed in a substrate with a trench having an upper region and a lower region. A dielectric layer formed of tungsten oxide, serves as a capacitor dielectric. The

tungsten oxide dielectric layer covers both the lower and upper regions of the trench capacitor. The claimed invention further includes a conductive trench filling formed of tungsten-containing material that extends through the lower region and through the upper region of the trench.

The Arnold reference discloses a memory cell for a dynamic random access memory including a pass transistor and a storage capacitor. The capacitor is a vertical capacitor formed along a deeper portion of the trench and has a lower polysilicon layer in the trench. The capacitor has a deep doped well in the body. The reference shows an insulating layer 34 of silicon oxide or silicon nitride, or both, which only covers the walls of the lower portion 28a of the trench 28. The layer ends on the top or upper side of the lower region 28a as shown in Fig. 1. The sidewalls of the trench in the upper region of the trench are only covered by a collar formed of dielectric layers 50, 58, or 150, 158, which serve to isolate the trench fill layer 32 where the trench has a narrower width.

The Nishamura reference discloses a semiconductor IC device having a memory cell. A word line is buried in a groove formed in a semiconductor layer. A capacitor is formed on the

surface of the semiconductor layer. The capacitor is a planar capacitor, not a trench capacitor as recited in the claims.

The Economikos reference discloses a trench capacitor formed in a substrate and fill material 30' completely filling the trench. A dielectric layer 24' is disposed only in a lower region of the trench. The layer ends below a collar layer 23 as shown in Fig. 6.

None of the references show "said trench having an upper region and a lower region and a conductive trench filling formed of tungsten-containing material disposed in said upper and lower regions of said trench; and a dielectric layer formed of tungsten oxide material lining said lower and upper regions", as recited in claim 1 of the instant application. Independent claim 20 contains the same limitations.

In the second full paragraph of item 1 on page 4 of the above-identified Office Action, claims 4-8 have been rejected as being unpatentable over Arnold in view of Nishimura, Economikos and further in view of Wallace et al. (U.S. Pat. No. 6,277,681) (hereinafter "Wallace") under 35 U.S.C. § 103(a).

The arguments and discussion presented above relative to the Arnold, Nishamura, and Economikos references are applicable in the rejection of these claims.

Additionally, Wallace discloses a capacitor with a substrate 11 and a first dielectric layer 13 of silicon nitride. The layer 13 is separated by a second dielectric layer 15 of tantalum pentoxide from a third dielectric layer 17 of silicon nitride.

It is respectfully submitted that Wallace does not make up for the deficiencies of the other references discussed above.

The Examiner has extracted isolated features disclosed in the secondary references and with hindsight (from the claims of the instant application) has reconstructed the claimed invention of the instant application by adding the features to the primary Arnold reference. It is submitted that the proposed combination of references is improper.

A critical step in analyzing the patentability of claims pursuant to 35 U.S.C. § 103 is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field. See In re Dembiczak, 175 F.3d 994, 999, 50 USPQ2d 1614,1617 (Fed. Cir. 1999).

Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one "to fall victim to the insidious effect of a hindsight syndrome wherein that which only the invention taught is used against its teacher." Id. (quoting W.L. Gore & Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 313 (Fed. Cir. 1983)).

Most if not all inventions arise from a combination of old elements. See In re Rouffet, 149 F.3d 1350, 1357, 47 USPQ2d 1453,1457 (Fed. Cir. 1998). Thus, every element of a claimed invention may often be found in the prior art. See id.

However, identification in the prior art of each individual part claimed is insufficient to defeat patentability of the whole claimed invention. See id. Rather, to establish obviousness based on a combination of the elements disclosed in the prior art, there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by the appellant. See In re Dance, 160 F.3d 1339, 1343, 48 USPQ2d 163.5, 1637 (Fed. Cir. 1998); In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125,1127 (Fed. Cir. 1984).

The motivation, suggestion or teaching may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or, in some cases the nature of the

problem to be solved. See Dembiczak, 175 F.3d at 999, 50 USPQ2d at 1617. In addition, the teaching, motivation or suggestion may be implicit from the prior art as a whole, rather than expressly stated in the references. See WMS

• Gaming, Inc. v. International Game Tech., 184 F.3d 1339, 1355, 51 USPQ2d 1385, 1397 (Fed. Cir. 1999). The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art. See In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981) (and cases cited therein).

Whether the examiner relies on an express or an implicit

• showing, the examiner must provide particular findings related thereto. See Dembiczak, 175 F.3d at 999, 50 USPQ2d at 1617.

Broad conclusory statements standing alone are not "evidence."

Id. When an examiner relies on general knowledge to negate patentability, that knowledge must be articulated and placed on the record. See In re Lee, 277 F.3d 1338, 1342-45, 61 USPQ2d 1430, 1433-35 (Fed. Cir. 2002).

Upon evaluation of the Examiner's response, it is respectfully believed that the evidence adduced by the Examiner is insufficient to establish a prima facie case of obviousness with respect to the claims. Accordingly, the Examiner is requested to withdraw the rejection.

Independent claim 20 is believed to be patentable over the prior art for at least the same reasons discussed above relative to claim 1.

- Additionally, the references do not show "a barrier layer disposed between said dielectric layer and said substrate and having an upper end, said barrier layer disposed in said upper and lower regions; and an insulation layer disposed between said dielectric layer, said barrier layer, and said insulation collar, said insulation layer extending from said upper end of said barrier layer to said upper end of said insulation collar and said dielectric layer", as recited in claim 20.

- Nor do the references show a "trench capacitor including a conductive buried bridge portion covering at least a portion of each said top surface of said conductive trench filling, said dielectric layer, and said insulating layer and connecting to a doped region of a transistor", as recited in dependent claim 22.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claim 1 and new claim 20.

Claims 1 and 20 are, therefore, believed to be patentable over the art. The dependent claims are believed to be patentable

as well because they all are ultimately dependent on claims 1 or 20.

- In view of the foregoing, reconsideration and allowance of
- claims 1, 3-9, and 20-22 are solicited.

In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate receiving a telephone call so that, if possible, patentable language can be worked out. In the alternative, the entry of the amendment is requested, as it is believed to place the application in better condition for appeal, without requiring extension of the field of search.

If an extension for this paper is required, petition for extension is herewith made.

The fee for excess claims in the amount of \$18.00 is enclosed herewith.

Please charge any other fees that might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner and Greenberg, P.A., No. 12-1099.

Respectfully submitted,


For Applicants

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Version With Markings to Show Changes Made:

Claim 1 (twice amended). A trench capacitor, comprising:

- a substrate formed with a trench;

said trench having an upper region and a lower region and a conductive trench filling formed of tungsten-containing material disposed in said upper and lower regions of said trench;

an insulation collar formed in said upper region;

- a buried well formed in said substrate, said lower region at least partly extending through said buried well; and

a dielectric layer formed of tungsten oxide material [for] lining said lower and upper regions [region], said dielectric layer serving as a capacitor dielectric.

Claim 7 (amended). The trench capacitor according to claim [4] 20, wherein said barrier layer is formed of a material selected from the group consisting of silicon oxide, silicon nitride, oxynitride, tungsten nitride, titanium nitride, and tantalum nitride.